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ABSTRACT

This report describes a project that developed a "Train the Trainer" program that would enable individuals to learn and teach the alternative instructional technique, Tic Tac Toe Math, developed by Richard Cooper for adult basic education students. The pilot workshop conducted as part of the project identified problems that traditional teachers have in learning Tic Tac Toe Math. Solutions to the problems were incorporated into a "Train the Trainer" packet. This packet allowed trainers either to teach Tic Tac Toe Math to other teachers or conduct a workshop using the videotape of Cooper teaching the system. (YLB)

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ED 395 126

Tic Tac Toe Math

Train the Trainer

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Abstract Page

Title: Tic Tac Toe Math Train the Trainer

Project Number: 99-5034 Funding: $8,436.00

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Purpose: The purpose of this project was to develop a train the trainer program which would enable individuals to better learn and teach the alternative instructional technique, Tic Tac Toe Math, developed by Richard Cooper.

Summary of Findings: The pilot workshop conducted as part of the project identified a number of problems which traditional teachers have in learning Tic Tac Toe Math. Solutions to these problems were incorporated into the Train the Trainer Packet which was produced.

Comments: This project resulted in a packet which allows trainers to either teach Tic Tac Toe Math to other teachers or conduct a workshop using the video tape of Dr. Cooper teaching the system.

Products: Tic Tac Toe Train the Trainer Packet: (containing: overhead transparencies, handouts, 2 hour training video, Tic Tac Toe: Instructional Guide and three workbooks.)

Descriptors:

Introduction

In 1987, Dr. Richard Cooper developed a method for teaching math to individuals with varying degrees of learning differences, problems and disabilities. This method for doing multiplication, division and fractions uses visual patterns rather than memorization of the multiplication facts. Since one of the patterns is from the game Tic Tac Toe, he entitled his method Tic Tac Toe Math. At first Dr. Cooper used this unusual way of doing math to help his students, who could not learn the multiplication tables, perform better in school. He soon found that it was a very effective method for students attempting to obtain a GED (General Educational Development) diploma. Many of these individuals were not able to master the mathematics required to pass the test because they just could not remember the multiplication tables. In everyday life these people would use a calculator to complete math operations, but unless they had a formal diagnosis of disability, they were not permitted to use a calculator for the GED examination.

Because of his work with individuals with learning differences, Dr. Cooper conducts many teacher training programs. He began to include Tic Tac Toe Math as part of these programs. At first the method was met with much resistance from teachers, especially teachers of mathematics. They did not see the need for an alternative system and, because of their knowledge of the multiplication facts, did not see the visual patterns. This prompted Dr. Cooper to write the *Tic Tac Toe Math: Instructional Guide* in 1988. He believed that many of the teachers who criticized the method would understand and accept it as an alternative way for students who could not learn the

multiplication facts. In the meantime, he continued to teach his students Tic Tac Toe Math. For some it was like magic, they picked up the system immediately, often in less than an hour. For others it was not as revolutionary, but they were able to learn the system and use it to do math. Still others did not learn the system, or simply wanted to learn the multiplication facts like everyone else.

Statement of the Problem

The problem addressed in this project is the fact that many individuals who already know the multiplication number facts have difficulty understanding and learning Tic Tac Toe Math. In the 1992 Winter Issue of the *GED on TV: Adult Education Showcase*, a publication of Kentucky Educational Television, the following statement appeared: "His 'why not?' attitude led him to discover 'Tic Tac Toe Math,' an elegantly simple structure for figuring out multiplication problems to infinity. Tic Tac Toe Math reveals a curious irony. While many LD students are able to grasp the basic concept in just a couple of hours, traditional math teachers often have difficulty with this drastic departure from the traditional approach."

The need to develop a Train the Trainer Program arose for a number of reasons. The first is that the method is growing in popularity so more people want to learn it and Dr. Cooper cannot personally train them all. The second reason is that while traveling around the country conducting training programs about individuals with learning differences, he found that some teachers were teaching students to use Tic Tac Toe Math, but they were not using the correct

patterns and had misconceptions about this alternative multiplication system.

For example, some teachers found that their students, who could not otherwise do so, could do long division using Tic Tac Toe Math. Without knowing or understanding the method they tried to teach the students Tic Tac Toe Math. For example one teacher taught the students to create the grids by adding the number in the first position to all the sequential numbers to produce the Tic Tac Toe Math grid. Although this works it is not very efficient nor does it use the visual patterns. A director of an adult basic education program stated that he gave the system to a math teacher who "figured it out". This math teacher said to the director that the system was simply 1X, 2X, 3X, 4X, 5X, 6X, 7X, 8X, 9X. That is true, but how does that help a student who does not know the multiplication facts?

There are many patterns in Tic Tac Toe Math, some of which are not necessary for teaching or using the system. The patterns which are used are those which have a wide application and lead directly to the formation of the completed time table in the Tic Tac Toe grid. Dr. Cooper has found that focusing on patterns which are unique to one grid or multiplication table does not help the students to learn the Tic Tac Toe system. However, he has encountered a number of teachers who do not understand this. These teachers would focus on whatever pattern they saw in the individuals grids and tried to use these to teach their students. Since many of these patterns were unique to individual grids, they tended to confuse rather than assist the students.

In some adult education programs, there are students who have learned to use Tic Tac Toe Math, but their teachers have not. In these programs, when a new student is identified as not knowing the multiplication facts, he or she is referred to the student or students who know and use the system.

Some teachers have learned how to make the single digit grids but not double or multiple digit grids. This means that their students are not able to use Tic Tac Toe Math for long division. This is truly unfortunate because Tic Tac Toe Math makes solving long division problems very easy and is often quicker than traditional methods.

One other use of Tic Tac Toe Math, which does not enable students to use the complete system, is using the grids solely as a multiplication chart. Teachers will pass out the completed grids, and students use them as they would any other multiplication chart. This use of the Tic Tac Toe Math grids robs the students of the ability to make the multiplication grids through infinity because it does not teach them how to make the grids for any math problem they encounter.

Goals and Objectives

The goal of this project was to improve the instruction of mathematics for adults with specific learning disabilities and problems, and to increase the availability of staff development programs in mathematics for adult educators and volunteer tutors.

There were three specific objectives:

1. To develop a "Train the Trainer" program for Tic Tac Toe Math.

2. To produce a packet of material which can be used by trainers to easily teach adult educators and volunteer tutors how to use and teach Tic Tac Toe Math.

3. To train adult educators and volunteer tutor trainers to conduct Tic Tac Toe Math Workshops.

The Project Procedures

The staff of the Center for Alternative Learning began the project by developing a survey which it distributed throughout Pennsylvania. The survey was distributed even more widely through *What's the Buzz* and at the PAACE Midwinter Conference. It was also distributed in a number of other states by Dr. Cooper at training activities and through the Center's *Learning disAbilities Newsletter* which is distributed nationally.

In all, there were 50 surveys returned to the Center providing the staff with some interesting data. For example, 56% of the respondees said that they were able to learn the Tic Tac Toe Math system. Those that weren't able to learn it mainly said that if they had had more time, they would be able to understand it. Since everybody learns at a different rate, some slower than others, this response is a common one.

Of those that did grasp the concepts in Tic Tac Toe Math, 86% claimed to be able to teach Tic Tac Toe Math. However, out of this relatively high number of respondees claiming to be able to teach Tic Tac Toe Math, only 25% indicated that they know the complete system. This is an important piece of information since it indicates that of the 24 respondees claiming to be able to teach Tic Tac Toe

Math, only six fully understand the system. This specific statistic, while perhaps not entirely representative of all individuals teaching Tic Tac Toe Math, indicates that the majority of teachers of Tic Tac Toe Math do not fully understand the system. Since so many teachers are unsure of the whole system it is understandable that their students also would have difficulty learning the complete system. Clearly, this is not the best of situations, and one of the major problems this project aimed to address.

It is also interesting to note that of the six people that know the complete Tic Tac Toe Math system only one of them taught it with any variation to Dr. Cooper's technique. On the other hand, there were 18 different variations used by the teachers that did not fully understand the Tic Tac Toe Math system.

Pilot Training Workshop

On March 1st the Center's staff conducted a pilot training workshop for Tic Tac Toe Math. This workshop was attended by individuals with varying degrees of knowledge of Tic Tac Toe Math. The format of the workshop was informal and intentionally designed to solicit comments from the participants. The Tic Tac Toe Math workshop was conducted as usual except for stops after each segment to analyze what the participants understood, and what they did not understand, so as to obtain an explanation of why they did not understand. This was done for each of the sections of Tic Tac Toe Math: the rationale for the method, the patterns, single digits, multiplication, division, double digits, multiple digits and using Tic Tac Toe Math with fractions. Since the participants included individuals

with varying degrees of familiarity with Tic Tac Toe Math, the information obtained included the learning strategies of both beginners and those who had some knowledge of the system.

The most important finding from the pilot workshop was the need to more clearly define the patterns for individuals who did not naturally learn well with patterns. Tic Tac Toe Math is very easy to learn if the learner identifies patterns easily and if he or she does not have a prior knowledge of the multiplication facts. Many teachers do not fit this profile, and, therefore, they have difficulty learning the system in the way that many individuals with learning differences learn it. The pilot workshop participants emphasized the need to make all the patterns clear so that they were easily isolated from each other and from the completed multiplication tables so that the person who knows the multiplication facts can see the patterns.

The second finding was the need for a number of handouts for teachers. These included a diagram of the visual patterns, a summary of these same patterns spelled out in words, and a list of helpful hints for teaching students who have manifested common problems learning Tic Tac Toe Math.

The third finding of the pilot workshop was the fact that some participants learn the system very quickly, many faster than it is being presented. Others do not understand it and even after the workshop do not know or understand Tic Tac Toe Math (let alone know how to teach it). The participants in the pilot workshop who had difficulty understanding the system reported that they did not feel comfortable asking questions because they did not know what to ask and they observed the others were not having problems learning Tic Tac Toe

Math. One solution to the problem of varying learning speeds in the teacher training workshop is to identify those who quickly learned the system and have these individuals teach those who have difficulty. This will provide those who have learned the system the opportunity to experience teaching it and provide those who do not understand Tic Tac Toe to have individual or small group instruction where their questions about the system can be articulated and answered.

The fourth finding of the pilot workshop was the need to provide a follow-up so that those who think that they have learned the system can have questions answered when they go to use or teach Tic Tac Toe Math. Many of the participants, especially those who have been previously exposed to the method, reported that they could not remember the whole system when they had the opportunity to teach it. Since they were not completely confident that they could remember it, these teachers did not attempt to teach it to their students.

Another finding of the pilot workshop was that if teachers do not understand the rationale for Tic Tac Toe Math they have more difficulty learning the system.

The Follow-up Pilot Workshops

Although one follow-up pilot workshop was planned, opportunities to offer a number of follow-up workshops were found. This provided the Center's staff with time to experiment with a number of the recommendations which resulted from the first pilot workshop.

Dr. Cooper and Martin Murphy conducted 10 Tic Tac Toe Math workshops in March, April and May to groups around the state. These workshops were part of day long seminars which the Center

conducted. More than 100 individuals, most of them adult educators, participated in these workshops. These follow-up workshops demonstrated that by implementing the recommendations developed from the first pilot workshop, the trainers were able to teach Tic Tac Toe Math more efficiently and fewer students reported that they did not fully understand the system.

Objectives Which Were Met

All the goals and objectives of the proposed project to develop a Train the Trainer Program for Tic Tac Toe Math were met during the course of this project. Adult educators who were involved in the project reported that they had a better understanding of why adults with learning problems have difficulty with math and felt that they had learned an alternative instructional technique (Tic Tac Toe Math) which would help some adult students become more successful learning math . Each of the specific objectives were also met. The first, to develop a Train the Trainer program, was achieved by surveying adult educators and using that information to develop pilot workshops. The information obtained from the survey and pilot workshops was used to create a Tic Tac Toe Math Workshop Packet. This packet contains handouts, overhead transparencies, a video and the Tic Tac Toe books. Trainers have the option of conducting a workshop on Tic Tac Toe Math or using the video as the delivery system.

Evaluation

Each of the pilot workshop participants, over 100 adult educators, reported that the instruction they received was well done and helpful. Most felt that they would be able to teach Tic Tac Toe Math to their students.

The external evaluator, Dr. Margaret Roach, reviewed the project and the packet and reported that it was well done. She believes that it will contribute to the staff development material for adult educators and also ultimately result in many students with learning problems improving their math skills.

Dissemination

This final report and the Train the Trainer Packet is available at the Pennsylvania Resource Centers (AdvancE and the Western Pennsylvania Resource Center). A number of copies are also available for loan at the Center for Alternative Learning. An announcement about the project completion and the Trainer packet will be placed in the *Learning disAbilities Newsletter*.

Conclusion

The Train the Trainer Packet which was produced as part of this project includes overhead transparencies and handout sheets for teaching Tic Tac Toe Math, a video tape of Dr. Richard Cooper teaching the Tic Tac Toe Math system and the Tic Tac Toe Math Books:

Tic Tac Toe Math: Instructional Guide

Tic Tac Toe Math Workbook One

Tic Tac Toe Math Workbook Two

Tic Tac Toe Math Workbook Three.

Trainers can learn the system by using the Instructional Guide and the video and conduct workshops using the overheads and handouts or they can use the video tape to conduct workshops. Trainers can also obtain more information or technical assistance by calling Dr. Richard Cooper, or the staff, at the Center for Alternative Learning (610-525-8336 or 1-800-869-8336).

TIC TAC TOE MATH – –
An Alternative Method for Learning Problem Adults

TTTM is a method developed by Dr. Richard Cooper, Director of Learning disAbilities Consultants in Bryn Mawr.

Workbook #2 provides the student with exercises designed to enhance the integration of the program into any math instructional program; Workbook #3 shows the student how to use TTTM with fractions.

TRAIN THE TRAINER PROGRAM.

Dr. Cooper is presently involved with a Section 353 project to develop a curriculum packet that would enable trainers to effectively teach adult educators and volunteer tutors how to teach Tic Tac Toe Math.

THE PROJECT NEEDS YOUR HELP.

So as to base these materials on the needs and experiences of adult basic and literacy education practitioners, we are asking ***Buzz*** readers to complete the questionnaire on the other side of this page and return the completed survey to Dr. Cooper as soon as possible.

"What's the Buzz?" will print the survey results and more information about training sessions in later issues.

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Tic Tac Toe Math "Train the Trainer" Project
1994-1995 Section 353 Project Survey

NAME _____

STREET _____

CITY _____ STATE _____ ZIP _____

PHONE # _____ FAX # _____

1. Do you consider yourself...

   a) a math teacher
   b) good with math
   c) fair with math
   d) frightened of math
   e) avoiding math

2. How did you first hear about Tic Tac Toe (TTT) Math?

   a) a workshop
   b) a TTT video
   c) TTT Instructional Guide
   d) a TTT workbook
   e) other

3. Were you able to learn Tic Tac Toe Math?

   ___ Yes (proceed to Question 4) ___ No (proceed to Question 9)

4. How long did it take you to grasp the ideas and be able to teach them? (Please attach a separate sheet of paper)

5. Are you able to teach the Tic Tac Toe Math system?

   ___ Yes ___ No. Why not? (Please attach a separate sheet of paper)

6. Are you able to use/teach the complete Tic Tac Toe Math system? (Check all levels you feel competent using &/or teaching.)

   ___ Building single digit grids (including odd & even concepts, summing to ten and visual patterns)
   ___ Multi-digit grids
   ___ Multiplication
   ___ Division
   ___ Fractions

7. How do students respond to your instruction? (Please attach a separate sheet of paper)

8. Do you teach with any variations in:

   a) odd & even concepts
   b) patterns
   c) single digit grids
   d) multi-digit grids
   e) division, multiplication or fractions
   f) other

(Skip to Question # 11)

9. If you were not able to grasp the concepts used in Tic Tac Toe Math what prevented you from being able to do so? (Please attach a separate sheet of paper)

10. Are you still interested in learning Tic Tac Toe Math?

    ___ Yes ___ No

11. Are you willing to participate in a Pilot Workshop for developing a Train the Trainer Curriculum?

    ___ Yes ___ No

Please return this survey to:

Center for Alternative Learning, P.O. Box 716, Bryn Mawr, PA 19101